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FROM THE EDITORS

MANAGING RISK AND RESILIENCE

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Editor's note: This editorial is part of a series written by editors and co-authored with a senior executive, thought leader, or scholar from a different field to explore new content areas and grand challenges with the goal of expanding the scope, interestingness, and relevance of the work presented in the Academy of Management Journal. The principle is to use the editorial notes as "stage setters" to open up fresh new areas of inquiry for management research. GG

Ten years of Global Risks Reports by the World Economic Forum show a daunting list of risks that challenge mankind, including water and food crises, terrorist attacks, cybercrime, financial crises, and extreme weather events, among others (Global Risks, 2015). The number of these high-risk events worldwide has steadily increased from around 350 in 1980 to almost 1000 per year in 2014 (GAR, 2015). Managing the devastation of these disaster events extends beyond concerns about mortality: economic losses are rising from around US\$ 50 Billion in the 1980's to around US\$ 250 Billion in the last decade (GAR, 2015). Similarly, cataclysmic effects caused by climate change will, with increasing regularity, shape business and society (Howard-Grenville et al., 2014).

The larger scale and impact of adverse events is the result of the increased density of global networks of people, organizations and countries. High-risk events that at first seem to cause only local, isolated effects can now snowball in magnitude and do damage to vital infrastructures that impact events on a regional and even global scale. The ash from the erupted Eyjafjallajökull volcano in Iceland, for example, disrupted air transport across Europe and strongly affected the whole world's manufacturing supply chain. At its peak, the crisis impacted 29 percent of global aviation and affected 1.2 million passengers a day. Businesses lost billions in uninsured losses (Munich Re, 2010). The Hengchun earthquake, in Taiwan 2006, involved limited loss of life and injury, and although buildings collapsed, fires

broke out, and the Maanshan Nuclear Power Plant was affected, the situation was kept under control. However, the earthquake severely damaged the submarine communication cables that served much of East and South-East Asia, with profound effects on communications and financial transactions in the area (Smith & Petley, 2009).

Although adverse events of all kinds are inevitable and have larger impacts, some organizations and societies are better able to sustain and rebound from such shocks than others. Analyses of recovery processes after the New Zealand earthquakes revealed that businesses with strong pre-existing organizational networks were better able to access support and organize themselves than those who had not (Stevenson et al., 2014). And although the quadruple disaster—earthquake, tsunami, nuclear alert and power shortages—that hit Japan in 2011 severely damaged the supply chain of Toyota, resulting in a global production loss for the company of 5% in 2011, Toyota claimed it was able to limit its losses due to the collective and coordinated efforts of suppliers, dealers and overseas operations (Asano, 2012). In contrast, the Haitians are still struggling to rebuild after the much smaller quake they endured in 2010.

Why do some organizations and societies successfully adjust and even thrive amidst adversity while others fail to do so? With this editorial, we would like to inspire management scholars to take up the “grand challenge” of studying the role and functioning of organizations during adverse natural or social events. Organizations form the nexus between individuals and societies. They provide employment for a large proportion of the community, and play an important role in delivering the essential services we all rely on in our daily lives, such as electrical power, water, food, health, communications systems, financial services and transportation. Organizations also work together to shape and mitigate the consequences of disasters when they occur. More research focusing on a better understanding of the role and

functioning of organizations in the face of adverse events may therefore help to better deal with disasters and ultimately benefit society as a whole.

Understanding and Managing Risk

The risks and adverse events we will focus on in this editorial are disasters and organizational crises. McFarlane and Norris' (2006: 4) defined a *disaster* as “a potentially traumatic event that is collectively experienced, has an acute onset, and is time delimited; disasters may be attributed to natural, technological, or human causes.” A *crisis* is a low-probability, high-impact event that threatens the viability of the system and is characterized by ambiguity of cause, effect, and means of resolution, as well as by a shared belief that decisions must be made swiftly (Pearson & Clair, 1998: 60). These adverse events are caused by factors outside the system, unexpected, and require immediate action. Examples include hurricanes, floods, earthquakes, large industrial and nuclear accidents, terrorist attacks and explosions.

The traditional way of coping with adverse events is to develop approaches and systems to identify risks. Empirical data, probability distributions, and mathematical models are used to analyze past and predict future adverse events. These forecasts enable decision-makers to anticipate disturbances to the “normal” state of affairs and to make more informed decisions about how to manage risk portfolios. While such an approach can certainly help societies and companies to anticipate and mitigate the consequences of some disasters and disruptions, it is usually impossible to identify all potential risks and to collect all the information necessary to conduct adequate risks assessments. Indeed, in all of the examples above, traditional risk management practices were insufficient to provide protection against the crises that took place. A key characteristic of many of the crises societies face nowadays is that they are triggered by improbable events whose causes are not well understood. Many crises emerge from a pattern of several events coinciding in space and time, and the joint occurrence and cascading consequences of such adverse events are hard to anticipate and predict.

To cope with disruptive events that cannot be adequately addressed with traditional risk management systems, a small but growing number of academics, managers, policy makers, and politicians have shifted their attention from identifying and mitigating risk to trying to increase *resilience*. The term resilience comes from the Latin word *resilire* (to leap or jump back). Resilience can be a characteristic of many different types of human collectives (e.g., families, organizations, and societies) that are, “as the Japanese say, like bamboo, which bends under the weight of winter snow but stands tall again come springtime.” (Mitchell, 2013: i). Resilience reflects the ability of systems to absorb and recover from shocks, while transforming their structures and means for functioning in the face of long-term stresses, change and uncertainty. This requires actively understanding the risk landscape, determining where those risks are best owned and managed, strengthening the components of the system that help to face those risks, and understanding how the interrelatedness of these components affects system functioning.

In contrast to traditional risk management approaches that focus on the identification of risks and alleviating the level of vulnerability to external disturbances, adopting a resilience approach to disturbances implies focusing on capabilities and capacities that create or retain resources in a form sufficiently flexible, storable, convertible, and malleable that enables systems to successfully cope with and learn from the unexpected (Sutcliffe & Vogus, 2003). The term resilience thus has the positive connotation of flexibility and strengthening, whereas the term vulnerability can connote passivity, insecurity, and inevitability, which is not helpful for mobilizing action. Re-orienting from “vulnerability” to “resilience” also better captures the desired outcome—preparedness for dealing with unforeseen disruptive events.

ORGANIZATIONAL RESILIENCE

The concept of resilience has its intellectual roots in the field of individual psychology and the science of child behavior, where it referred to the ability of individuals to withstand

stress and bounce back or recover from traumatic events (Masten & Monn, 2015). In disaster management¹ and the organizational sciences, however, the dominant understanding of resilience has been influenced by approaches rooted in either the engineering or ecological sciences, where resilience is a characteristic of a *system* rather than of the system's individual parts (Adger, 2000). To understand a system's resilience, it is important to identify the capabilities and capacities of important parts of the system, and to examine how they interact with one another and with their environment to predict key performance outcomes at different levels of analysis before and after a disruptive event.

Systems, Networks and Resources

The most important parts of *organizations* as complex systems are, at the most basic level, its employees. A critical source of capacity for organizational resilience is contained in the characteristics of employees (Lengnick-Hall, Beck, & Lengnick-Hall, 2011; Luthans, Youssef, & Avolio, 2007). Many employee characteristics might be important in this regard, including individuals' skills and abilities, cognitions, affect, behaviors, and self-regulatory processes. Examples include intelligence, self-efficacy, emotional stability, openness to experience, social support, emotion recognition, self-discipline, resourcefulness, and cognitive flexibility. Aggregated to higher levels of analysis, these individual characteristics reflect the composition of organizational (sub)systems, such as teams and taskforces. In general, systems with a greater breadth of resources offer potentially access to more tools that might be used to withstand external disturbances and respond in an effective way (Page, 2014). Research has shown, for example, that the composition of teams in terms of

¹ In the context of disaster management, the term resilience was established with the adoption of the Hyogo Framework for Action 2005-2015 by the United Nations as the result of the World Conference on Disaster Risk Reduction in 2005. The framework focused on the prioritization of risk reduction, identifying risks and enhancing early-warning systems, building a culture of safety and resilience, reducing underlying risk factors, and strengthening disaster preparedness and response capabilities.

personality and abilities significantly relates to their viability and ability to work together (Bell, 2007).

Whereas the composition of individual characteristics determines the system's *potential* for resilience, the relationships between individual employees and the social network in which these individuals are embedded strongly determine the availability and accessibility of these capabilities and resources for adaptive responses. Resources embedded and available in social relationships can only be accessed and mobilized when actors engage in purposeful actions (i.e., social capital; Lin, 1999). Relationships between employees characterized by openness and generativity—where new things are learned, new opportunities identified, and new insights originate—enable collections of individuals to use their collective resources, process information, make sense of emergent issues, and see opportunities for effective courses of action (Carmeli et al., 2013). Moreover, dense organizational networks can help to detect disturbances early, respond quickly, and prevent a disturbance from spreading. At the same time, overly dense networks reduce efficiency and flexibility because maintaining redundant contacts with large numbers of individuals is difficult and time-consuming. It also creates interdependencies that can allow for a chain reaction of problems or issues to arise. In times of crisis, therefore, diverse modular systems, with bridges or hubs between different sub-systems that retain some self-sufficiency when disconnected from larger networks, may be better in terms of efficiency and effectiveness (Burt, 1992).

Organizational structure and decision-making

Clearly, the resilience of organizations not only depends on the availability and accessibility of resources, but also on the formal organizational structure. Contingency theory suggests that although mechanistic organizational forms are sufficient in stable environments, changing environments require more organic organizational forms, with greater connectedness among employees (Lawrence & Lorsch, 1967). The very nature of

emergencies requires that organizations are able to adopt decentralized decision-making structures, rather than relying on hierarchy and centralization of authority. During crises, formal role descriptions usually no longer suffice, new procedures have to be invented, and new ways of cooperation may need to be developed. Such adaptive responses require the ability to quickly transform the formal structure and to use decentralized, team-based or network approaches to problem solving. Case studies related to organizational resilience indeed suggest that highly bureaucratic, command-and-control style structures impede creativity and adaptive behaviors by employees (McManus, Seville, Vargo & Brunsdon, 2008).

Finally, organizational resilience is strongly affected by the relationships with other organizations and the environment. Many of today's organizations are interconnected and interdependent in supply chain networks. Problems experienced by one organization can therefore strongly impede the functioning of other organizations. The worldwide trend in the last decades to increase the effectiveness and the efficiency of supply chains has not only reduced costs, but has also increased vulnerability to disruptions: even small, local events can escalate rapidly thereby disrupting business continuity and sustainable performance. Research suggests that 75% of the companies experience a supply chain disruption at least once per year, out of which 21% suffer more than €1 Million in costs associated with a single incident (Business Continuity Survey, 2013). Good insight in the total supply chain network and how disruptions in specific parts of that network may affect overall production, improves the ability to reduce the negative consequences associated with supply chain disruptions. After the Great East Japan earthquake and tsunami, for example, manufacturers like Toyota discovered that they had insufficient insight in their 3rd- and 4th-tier suppliers (Wardsauto, 2012). This motivated Toyota to analyze future risks and their resilience capacity for faster recovery.

MANAGING RESILIENCE: A RESEARCH AGENDA

Although the notion of resilience has been widely used in the psychological and socio-ecological literatures, empirical research on the factors that contribute to organizational resilience is scarce, despite calls for more research (e.g., Sutcliffe & Vogus, 2003; Weick & Sutcliffe, 2001). There is an abundance of valuable case studies, but also a clear need to use these observations to build more general theories that can be quantitatively tested and used to equip decision makers with better models to base crisis preparation and responses upon. Below, we identify a couple of interesting and important topics for research on organizational resilience that might be examined by management scholars.

Individual and Social Resilience

At the individual level of analysis, an important question is what determines how individual employees deal with adverse events, and what can be done to increase their resilience. Employees may be fully educated on the procedures and planning in a time of emergency, but the significant losses and trauma caused by adverse events may make it difficult for them to focus on the disaster response initiative. As a result, they may be unable to cope with the effects of the disaster and unable to help others. Interestingly, however, many people show clear evidence of individual resilience in the face of potential trauma (Bonanno, 2004). What are the personal and social factors that make these individuals resilient? What can be done to help employees deal with the effects of adverse events and how should human resources be managed not only before, but also *after* a disaster has taken place (Goodman & Mann, 2008; Pearson & Clair, 1998)? Addressing these questions is important not only for employees but also for employers. Employees' negative psychological reactions to adverse events may make employees more focused on self-preservation, less able to perform their roles, and lead to absenteeism at a time that organizations need their workers most (Ferris et al., 2007).

Another important question is how the absence of employees caused by significant losses and trauma affects the functioning and recovery of teams as subsystems of organizations. Research on team turnover suggests that this absence may negatively affect social integration, learning, and flexibility (e.g., Van der Vegt, Bunderson, & Kuipers, 2010). In the context of an adverse event, different processes that influence team turnover and fluidity may be more salient, and our assumptions about the negative effects of turnover and absenteeism may require revision. Research has shown that, in response to external pressures, employees engage in more timely communication (Orlikowski & Yates, 1994), and in more help seeking and giving (Anderson & Williams, 1996). This suggests that in times of crises, team members may engage in extra-role behavior, fill in for one another, and work more efficiently, which may dampen the potentially negative consequences of membership losses. Examining the effects of team turnover and membership changes under adverse conditions is an interesting area for team researchers.

Natural disasters and events such as political unrest also have profound implications for how family and societal structures respond and adapt. Whether it is Hurricane Katrina or the Boston Marathon bombing, social structure and galvanizing of support matters for social resilience. George et al. (2015) show that, in contexts of desperate poverty in Africa, natural shocks affect individual propensity to start a micro-enterprise but also that this effect is contingent on the social structure of the families and communities. When social structure disintegrates, families fall deeper into desperate poverty and starvation. Social resilience, of how communities come together post trauma events, will likely shape the journey towards restorative communal normalcy.

Coordination within and across organizations

In order to effectively deal with adverse events, teams may need to build and maintain direct working relationships with each other (Marrone, 2010). Increasing our understanding

of how responses to crises should be managed requires more knowledge of coordination processes in organizations. One issue is the role of lower-level lateral coordination and vertical coordination by supervisors in responding to emergencies. To what extent can or should the coordination of operational and task-related issues between teams be left to lower-level team members? And to what extent should supervisors and managers be involved in this process? One might argue that managers, who are uniquely positioned to understand overarching strategic issues relevant for the system as a whole, must coordinate lower-level activities. At the same time, it seems that continuous and strict vertical coordination is not efficient and may be even impossible because crises situations are hectic and chaotic. What is the right mix of horizontal and vertical coordination, and does the timing of these activities matter? It might be, for example, that providing strategic direction is especially important when progress is reviewed and task or environmental demands require system-level leaders to rethink or recast the system's direction (Uitdewilligen & Waller, 2011). Examining these issues requires research focusing on inter-team coordination processes and fine-grained multilevel data of how these processes evolve over time.

Network Resilience

Employee absence and malfunctioning communication systems due to emergencies may not only affect team functioning but also strongly affect the network ties between employees, the overall network structure, the spread of information within and between organizations, and thereby adaptive responses. Here we see interesting and important research possibilities for organizational network researchers. Barabási (2003), for example, has suggested that some network structures are more sensitive to node and link removal than others. Within "random" networks, missing nodes or a broken direct communication link between nodes does not necessarily have a large impact because alternative information routes via other nodes are available. Beyond a certain threshold, however, the loss of more

nodes or links abruptly breaks the network into unconnected subgroups. So-called “scale-free” networks are almost invulnerable to random node or link removal. At the same time, the focused and simultaneous removal of a few *critical* nodes may disable such networks. It would be interesting to examine which structural characteristics of social networks determine their vulnerability and robustness, and how changes in network structure influence the ability to learn and adapt (cf. Kahn, Barton, & Fellows, 2013). Much can be learned in this regard from research on terrorist networks and ways to disrupt them (see Ressler, 2006). This research has pointed to the importance of the average shortest path length between nodes (or network diameter), network clustering, and network hierarchy as important determinants of network resilience.

The topic of resilience is also clearly relevant for those studying supply chains. Given that supply chains are the backbones of the global economy and have a major influence on the social and natural business environments, there is an urgent need to find new ways of dealing with and overcoming inevitable supply chain disruptions and uncertainty. Unfortunately, most research on resilience in the supply chains literature has been conceptual; empirical research testing these conceptual models and examining the elements that are most likely to make supply chains resilient is needed. This research should also consider the price of creating resilient supply chains. The vast theoretical literature on supply chain resilience sketches an overwhelmingly positive image of resilience and rarely includes any discussion of the costs of increasing resilience. This is unbalanced, to say the least, because resilience is often described in terms of redundancy and slack, which indicates inefficiency and comes at a cost. The research challenge is to find ways to increase supply chain resilience while maintaining efficiency.

Governance and Tri-Sector Collaboration

Management scholars may also play an important role in developing actionable knowledge for effective governance (Tihanyi et al., 2014), especially in case of disaster relief operations or social or political crisis events. McManus et al. (2008) argue that organizations directly contribute to the speed and success of community recovery following a crisis or disaster. Indeed, dealing with the consequences of disasters requires the combined efforts of and considerable interaction between multiple agencies, organizations, businesses, and individuals to help save lives, restore economic foundations, and resume ‘normal’ life. Evident from the New Zealand case mentioned earlier and other case studies (e.g. NRC, 2011; Stevenson, 2014; Bach, 2015) is that the role of private-public collaboration at the local level is essential to the development of community resilience and economic risk reduction.

Tri-sector collaboration is the coming together of public and private sectors with civil society to jointly address issues of relevance to society. Events that affect communities can only be effectively dealt with when the community or civil society engages public or State entities and private corporations. The value of multi-stakeholder collaboration has long been recognized, but only recently such complex collaborative arrangements have received scholarly attention (Roehrich, Lewis, & George, 2014). Scholars have identified misunderstandings and conflicts resulting from differences between partner organizations’ working methods and cultures as reasons for why such efforts often fail, arguing that such issues may hinder the realization of collective goals (Lynch, O’Toole, & Biemans, 2014). Moreover, the different parties involved may hold fundamentally different goals and interests and strive to protect their autonomy and unique identity (Agranoff, 2006), which results in a delicate, paradoxical, process of addressing the demands for unity and diversity simultaneously (Ospina & Saz-Carranza, 2005). How can the problems of complex collaboration be overcome and managed? Research examining the factors that facilitate inter-

organizational collaboration before, during, and after crises can make an important contribution to our understanding of managing and mitigating the consequences of crises and disasters.

Examining organizational resilience

One of the reasons for the dearth of research on organizational resilience may be that studying resilience presents a challenge. Organizations typically constitute complex, large-scale entities that work on varying tasks, under very different circumstances, and with particular effectiveness criteria that do not lend themselves to easy comparison. It is not the purpose of this editorial to discuss in detail all methods that can be used to study resilience. Instead, we offer several suggestions for how researchers might operationalize (elements of) organizational resilience, and designs that might be used to examine the drivers of organizational resilience.

We would like to start by noting that it is difficult to determine whether a system or one of its components has recovered from an event and learned from experiences if there is no baseline from which to compare the observed performance of the system with what would have happened if the event had not taken place. Use of secondary data sources such as employment, wages, family structures, energy consumption, healthcare, household assets and wealth concentration can be useful benchmarks of pre- and post-disaster event at the societal level. Another possibility is to attempt repeated measures to derive the extent to which individuals, groups or the whole organization achieve their goals. Goal achievement should be reflected in scores on key performance indicators representing the variety of stakeholder interests critical for the viability of the focal entity. At the individual level of analysis, a viable indicator might be “wellness”—reflected in the absence of psychopathology, adequate role functioning, and high quality of life (Norris, et al., 2008). For teams and organizations, one can consider customer satisfaction, financial performance, transaction or logistics costs

and the timely delivery of services or goods. It is then possible to determine which characteristics and capabilities of (parts of) the system contribute to the ability of the system to achieve its goals. The ease with which scores on key performance indicators can be moved away from desired levels indicate system vulnerability or robustness. The adaptive capacity of the system might be operationalized as the time it takes for a system to recover from adverse events to pre-event scores on key performance indicators or perform even better. A system can be seen as more resilient when it is more robust and less vulnerable to disruptions and recovers faster from disruptions when they occur.

To study the factors that determine resilience, it may be necessary to measure the relevant characteristics and capabilities of individuals and (parts of) the systems, such as those discussed above, and relate those to individual or system vulnerability and recovery indicators. This requires the tracking of the functioning of individuals and systems over a longer period of time during which one or more disturbances take place. For groups or larger systems this could be realized in an experimental setting where individuals work together on a complex task, and after some time one or more interruptions are introduced. Although it is impossible to introduce ‘real’ disasters or crises, one could easily introduce disturbances that can be expected to result from such adverse events (e.g., failure of communication systems, high time pressure, and loss of team members). Individual characteristics of participants can be measured before the experiment, and relationship characteristics, emerging network structures and participant behaviors can be measured during the experiment. Such experimental designs not only allow researchers to collect data from a large number of systems working on similar tasks with objective performance criteria, but also to manipulate a variety of potentially important determinants of resilience, such as the composition of (parts of) the system, the relationships between individuals and groups, and governance structures used to manage the system.

Another option would be to examine resilience in field settings by means of ‘interrupted time-series designs’. In this case one would collect data about (sub)system performance at multiple levels and points in time. Many organizations store archival data on key performance indicators over longer periods of time that can be used for research purposes. Such data offer the unique opportunity to quantitatively examine the longitudinal effects of disruptions once they occur. Data about antecedents of resilience can be collected using a mix of qualitative and quantitative methods. One might use anonymized email data to operationalize network structures and data from organizations’ regular employee satisfaction surveys or disaster reports to measure emergent processes or individual responses to disasters (for examples, see Butts, Acton, & Marcum, 2012; Mendonca, Webb, Butts, & Brook, 2014). This enables researchers to examine the factors that predict system vulnerability, robustness, and recovery.

Irrespective of whether data will be collected in experimental or field settings, it is important to realize that resilience arises from a complex interplay of many factors at different levels of analysis. Resilience at one level may lead to resilience at other levels, such as when positive practices are transferred to a higher level. However, developing capacity for resilience at lower levels does not automatically increase the overall resilience of the system. Experts in an organization may be able to observe warning signs for an unpreventable adverse event, but their interactions with other experts and decision-makers may be decisive in terms of how the organization responds. Research is necessary to explore how organizations transform capacities and capabilities for resilience into organizational demonstrations of resilience. Moreover, because resilience emerges from interactions among variables at different levels that take place over time, changing circumstances may change the presence, importance, and contribution of each of these variables to resilience. A perspective

that uncovers the antecedents and processes underlying organizational resilience therefore most likely requires a multilevel and dynamic perspective (Lazega & Snijders, forthcoming).

Only if business is resilient, can society be truly resilient

As our society becomes more complex and interconnected, and the impact of global factors becomes more immediate and menacing, organizations will become more exposed to disruptive events from a broad range of threats and hazards. Effective response and recovery processes are crucial to deal with these events and to save lives. At the same time, proactive behavior and investment in prevention and mitigation is needed to reduce the short- and long-term negative social and economic impacts on people's lives and business. A crucial element in this strategy is to get agreement between governments to invest in building resilience at all levels of society (e.g., Sendai Framework for Disaster Risk Reduction 2015-2030). Governments cannot realize this alone, and neither can grass-root organizations. Building resilience requires the alignment of efforts at all levels of society, people, businesses, communities, cities, regions, and nations. This is a formidable task, but increasing our scientific knowledge of what can be done to make employees, groups, organizations, and networks of organizations more resilient may definitely help managers, policy makers and politicians to develop courses of action that make our society as a whole more resilient.

At the UN World Conference on Disaster Risk Reduction in Sendai Japan (March, 2015), 187 countries adopted the so-called Sendai Framework for Disaster Risk Reduction. In an interview with the Head of the UN ISDR Office, Mrs. Margareta Wahlström, we discussed the major scientific challenges in this development. Key issues are:

- The governance of risk, how much effort and control should be exerted by the government and how much by society, is still open for more scientific guidance;
- resilience as a social concept is not well developed and backed up by social science, and needs to be measured;
- the positive idea that a crisis is an opportunity for change so that people and assets become more resilient for a next crisis, is insufficiently backed up by evidence on how that works;
- scientists need not only gather data and turn it into *their* science, but also turn it around and contribute to capacity and institution building and provide access to the data;
- scientists could help to increase our understanding of how risks in the future might look like given long term trends of critical factors.

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